

## **Historic, Archive Document**

Do not assume content reflects current scientific knowledge, policies, or practices.



1.9  
En 83 Ppa

APR 10 1928

U. S. Department of Agriculture

Reserve

March 1, 1928.

PROGRAM AND PLAN

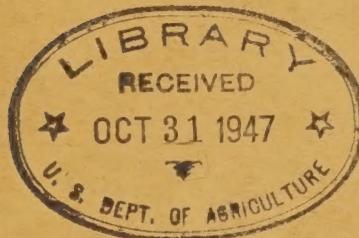
OF

EUROPEAN CORN BORER INVESTIGATIONS

1928.

Assignments to Laboratories

or Groups.



U. S. DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY



March 1, 1928.

TENTATIVE PROGRAM AND PLAN FOR CORN BORER INVESTIGATIONS AT  
ARLINGTON, MASSACHUSETTS (1928)

I - Control.

A - Plowing infested material.

1 - Field observations.

- a - Check effectiveness of fall and spring plowing, under farm conditions, following standard methods of debris examination. Special stress upon fields where larval population was determined in standing stalks or stubble before treatment. Compute percentage of control achieved, based upon larval population before and after treatment.
- b - Special observations upon status of weeds, grasses, trash, etc., along fence-row or field margin, of fields where infested cornstalks were plowed under.

B - Clean-up operations.

- 1 - Check results of general clean-up operations, including burning, feeding to livestock, etc.

C - Seasonal and varietal planting.

- 1 - Experimental plots of sweet, dent and flint corn at Waltham.
  - a - Standard varieties for the region planted on successive dates. Detailed observations same as in former years.
- 2 - Surveys of commercial fields, with relation to effect of time of planting and selection of varieties - as formerly.
- 3 - Analysis of applicable data secured during progress of annual infestation survey (from II-A-B and E)
- 4 - Continue phenological studies on the development of selected trees or shrubs, to correlate plant development with optimum time of planting to avoid severe injury, and with seasonal occurrence of the insect.
  - a - Same details recorded as formerly.

D - Host plants (with special reference to control, quarantine and scouting data).

- 1 - Continuation of host plant investigations.
  - a - List of host plants kept up to date.
  - b - Additional investigations relative to stages of insect occurring on known host plants.
  - c - Critical determination of status of principal host plants as true food plants or as shelter plants.
  - d - Continued investigations relating to suspected host plants.
  - e - Continued study of plants exhibiting toxic or repellent qualities to the corn borer.
- 2 - Continuation of isolation cages containing certain host plants infested by *P. nubilalis*, to determine ultimate effect of host plants, other than corn, on the insect and whether host plant races exist.

E - Trap crops.

- 1 - Analysis of annual infestation surveys as in previous years.

# - a - Beets, dahlias, hemp, *Polygonum*, *Xanthium*, *Ambrosia*, *Artemisia*

STAMP OF LOCAL BOARD

Date \_\_\_\_\_

## INVENTORY OF RECORDS

ITEM NO.	DESCRIPTION OF PACKAGE	DESCRIPTION OF CONTENTS	DATES COVERED	
			From—	To—
1	1	1		
2	2	2		
3	3	3		
4	4	4		
5	5	5		
6	6	6		
7	7	7		
8	8	8		
9	9	9		
10	10	10		
11	11	11		
12	12	12		
13	13	13		
14	14	14		
15	15	15		
16	16	16		
17	17	17		
18	18	18		
19	19	19		
20	20	20		
21	21	21		
22	22	22		
23	23	23		
24	24	24		
25	25	25		
26	26	26		
27	27	27		
28	28	28		
29	29	29		
30	30	30		
31	31	31		
32	32	32		
33	33	33		
34	34	34		
35	35	35		
36	36	36		
37	37	37		
38	38	38		
39	39	39		
40	40	40		
41	41	41		
42	42	42		
43	43	43		
44	44	44		
45	45	45		
46	46	46		
47	47	47		
48	48	48		
49	49	49		
50	50	50		
51	51	51		
52	52	52		
53	53	53		
54	54	54		
55	55	55		
56	56	56		
57	57	57		
58	58	58		
59	59	59		
60	60	60		
61	61	61		
62	62	62		
63	63	63		
64	64	64		
65	65	65		
66	66	66		
67	67	67		
68	68	68		
69	69	69		
70	70	70		
71	71	71		
72	72	72		
73	73	73		
74	74	74		
75	75	75		
76	76	76		
77	77	77		
78	78	78		
79	79	79		
80	80	80		
81	81	81		
82	82	82		
83	83	83		
84	84	84		
85	85	85		
86	86	86		
87	87	87		
88	88	88		
89	89	89		
90	90	90		
91	91	91		
92	92	92		
93	93	93		
94	94	94		
95	95	95		
96	96	96		
97	97	97		
98	98	98		
99	99	99		
100	100	100		
101	101	101		
102	102	102		
103	103	103		
104	104	104		
105	105	105		
106	106	106		
107	107	107		
108	108	108		
109	109	109		
110	110	110		
111	111	111		
112	112	112		
113	113	113		
114	114	114		
115	115	115		
116	116	116		
117	117	117		
118	118	118		
119	119	119		
120	120	120		
121	121	121		
122	122	122		
123	123	123		
124	124	124		
125	125	125		
126	126	126		
127	127	127		
128	128	128		
129	129	129		
130	130	130		
131	131	131		
132	132	132		
133	133	133		
134	134	134		
135	135	135		
136	136	136		
137	137	137		
138	138	138		
139	139	139		
140	140	140		
141	141	141		
142	142	142		
143	143	143		
144	144	144		
145	145	145		
146	146	146		
147	147	147		
148	148	148		
149	149	149		
150	150	150		
151	151	151		
152	152	152		
153	153	153		
154	154	154		
155	155	155		
156	156	156		
157	157	157		
158	158	158		
159	159	159		
160	160	160		
161	161	161		
162	162	162		
163	163	163		
164	164	164		
165	165	165		
166	166	166		
167	167	167		
168	168	168		
169	169	169		
170	170	170		
171	171	171		
172	172	172		
173	173	173		
174	174	174		
175	175	175		
176	176	176		
177	177	177		
178	178	178		
179	179	179		
180	180	180		
181	181	181		
182	182	182		
183	183	183		
184	184	184		
185	185	185		
186	186	186		
187	187	187		
188	188	188		
189	189	189		
190	190	190		
191	191	191		
192	192	192		
193	193	193		
194	194	194		
195	195	195		
196	196	196		
197	197	197		
198	198	198		
199	199	199		
200	200	200		
201	201	201		
202	202	202		
203	203	203		
204	204	204		
205	205	205		
206	206	206		
207	207	207		
208	208	208		
209	209	209		
210	210	210		
211	211	211		
212	212	212		
213	213	213		
214	214	214		
215	215	215		
216	216	216		
217	217	217		
218	218	218		
219	219	219		
220	220	220		
221	221	221		
222	222	222		
223	223	223		
224	224	224		
225	225	225		
226	226	226		
227	227	227		
228	228	228		
229	229	229		
230	230	230		
231	231	231		
232	232	232		
233	233	233		
234	234	234		
235	235	235		
236	236	236		
237	237	237		
238	238	238		
239	239	239		
240	240	240		
241	241	241		
242	242	242		
243	243	243		
244	244	244		
245	245	245		
246	246	246		
247	247	247		
248	248	248		
249	249	249		
250	250	250		
251	251	251		
252	252	252		
253	253	253		
254	254	254		
255	255	255		
256	256	256		
257	257	257		
258	258	258		
259	259	259		
260	260	260		
261	261	261		
262	262	262		
263	263	263		
264	264	264		
265	265	265		
266	266	266		
267	267	267		
268	268	268		
269	269	269		
270	270	270		
271	271	271		
272	272	272		
273	273	273		
274	274	274		
275	275	275		
276	276	276		
277	277	277		
278	278	278		
279	279	279		
280	280	280		
281	281	281		
282	282	282		
283	283	283		
284	284	284		
285	285	285		
286	286	286		
287	287	287		
288	288	288		
289	289	289		
290	290	290		
291	291	291		
292	292	292		
293	293	293		
294	294	294		
295	295	295		
296	296	296		
297	297	297		
298	298	298		
299	299	299		
300	300	300		
301	301	301		
302	302	302		
303	303	303		
304	304	304		
305	305	305		
306	306	306		
307	307	307		
308	308	308		
309	309	309		
310	310	310		
311	311	311		
312	312	312		
313	313	313		
314	314	314		
315	315	315		
316	316	316		
317	317	317		
318	318	318		
319	319	319		
320	320	320		
321	321	321		
322	322	322		
323	323	323		
324	324	324		
325	325	325		
326	326	326		
327	327	327		
328	328	328		
329	329	329		
330	330	330		
331	331	331		
332	332	332		
333	333	333		
334	334	334		
335	335	335		
336	336	336		
337	337	3		

2 - Special observations on selected farms where corn is planted on progressive dates.

F - Possible adaptation to insecticides.

1 - Critical study of feeding habits of young larvae on corn plants, i.e.; - extent of feeding on leaf-blades, tassel buds, etc., and proportion of larvae feeding on exterior of plant.

II - Dispersion (Same details as in previous years)

A - Similar corn surveys of cornfields in same townships as in original survey, in New England, eastern N. Y. and Long Island.

B - Similar surveys in cornfields of new townships along outside border of the older area.

C - Scouting for infestation in townships not previously recorded as infested.

D - Classification of area into zones according to character and intensity of infestation.

E - Special early season survey in sweet corn fields.

F - Special surveys of corn and weed areas in different representative types of terrain - i.e., river valleys, hill district and coastal plain.

G - Continuation of similar comparative surveys in important economic host plants other than corn. (beans, beets, celery, dahlias, chrysanthemums).

H - Continuation of special project to determine loss in yield of corn caused by indirect injury.

1 - Reduction in number of ears.

2 - do. weight do. and grain.

3 - do. quality do. do.

III - Mortality.

A - Continuation of larval establishment studies.

1 - Determine proportion of eggs which develop into mature larvae (each generation) in different representative localities and on different types of corn.

2 - Same on important plants other than corn. (economic)

3 - Same for important and susceptible weed hosts.

B - Winter mortality. (same details as formerly)

IV - Seasonal Occurrence and Season cycle.

A - Gross records of seasonal occurrence, reduced to a minimum, to secure same data as detailed in former programs.

B - Generation occurrence.

1 - Special stress upon field investigations, to determine percentage of individuals developing a second generation.

C - Phenological studies as mentioned under I-c-5.

D - Continuation of investigations relating to influences contributing to separation of different seasonal cycle zones (one and two generations).

**STAMP OF LOCAL BOARD**

Date

## **INVENTORY OF RECORDS**

ITEM NO.	DESCRIPTION OF PACKAGE	DESCRIPTION OF CONTENTS	DATES COVERED	
			From—	To—
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				
61				
62				
63				
64				
65				
66				
67				
68				
69				
70				
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				
92				
93				
94				
95				
96				
97				
98				
99				
100				
101				
102				
103				
104				
105				
106				
107				
108				
109				
110				
111				
112				
113				
114				
115				
116				
117				
118				
119				
120				
121				
122				
123				
124				
125				
126				
127				
128				
129				
130				
131				
132				
133				
134				
135				
136				
137				
138				
139				
140				
141				
142				
143				
144				
145				
146				
147				
148				
149				
150				
151				
152				
153				
154				
155				
156				
157				
158				
159				
160				
161				
162				
163				
164				
165				
166				
167				
168				
169				
170				
171				
172				
173				
174				
175				
176				
177				
178				
179				
180				
181				
182				
183				
184				
185				
186				
187				
188				
189				
190				
191				
192				
193				
194				
195				
196				
197				
198				
199				
200				
201				
202				
203				
204				
205				
206				
207				
208				
209				
210				
211				
212				
213				
214				
215				
216				
217				
218				
219				
220				
221				
222				
223				
224				
225				
226				
227				
228				
229				
230				
231				
232				
233				
234				
235				
236				
237				
238				
239				
240				
241				
242				
243				
244				
245				
246				
247				
248				
249				
250				
251				
252				
253				
254				
255				
256				
257				
258				
259				
260				
261				
262				
263				
264				
265				
266				
267				
268				
269				
270				
271				
272				
273				
274				
275				
276				
277				
278				
279				
280				
281				
282				
283				
284				
285				
286				
287				
288				
289				
290				
291				
292				
293				
294				
295				
296				
297				
298				
299				
300				
301				
302				
303				
304				
305				
306				
307				
308				
309				
310				
311				
312				
313				
314				
315				
316				
317				
318				
319				
320				
321				
322				
323				
324				
325				
326				
327				
328				
329				
330				
331				
332				
333				
334				
335				
336				
337				
338				
339				
340				
341				
342				
343				
344				
345				
346				
347				
348				
349				
350				
351				
352				
353				
354				
355				
356				
357				
358				
359				
360				
361				
362				
363				
364				
365				
366				
367				
368				
369				
370				
371				
372				
373				
374				
375				
376				
377				
378				
379				
380				
381				
382				
383				
384				
385				
386				
387				
388				
389				
390				
391				
392				
393				
394				
395				
396				
397				
398				
399				
400				
401				
402				
403				
404				
405				
406				
407				
408				
409				
410				
411				
412				
413				
414				
415				
416				
417				
418				
419				
420				
421				
422				
423				
424				
425				
426				
427				
428				
429				
430				
431				
432	</td			

1 - Material transferred from various areas and isolated in large field cages at Waltham.

a - From western New York (1 gen.)

b - From France (2 gen.)

c - From Italy (2 gen.)

d - From Hungary (1 gen.)

2 - Cross-breeding and rearing of

a - Mass. female - New York males.

b - " males - " " females.

V - Natural enemies.

A - Parasites (investigations in U. S.)

1 - Importation of parasites from Europe as in the past.

a - Storing of material as received from abroad.

b - Emergence and careful mating of adult parasites from above material.

(1) - Special precautions to prevent escape of hyper-parasites.

c - Liberation of parasite adults not required for breeding projects.

(1) - New England      (2) - New York      (5) - Michigan  
(3) - Pennsylvania      (4) - Ohio      (6) - Indiana.

d - Allot quota of parasite material to co-operators at Canadian Parasite Laboratory at Chatham, Ontario - following same procedure as in the past.

2 - Laboratory breeding of parasite adults for liberation, using imported adults as breeding stock.

a - Special campaign to produce large numbers of Apanteles sp. and Microgaster tibialis. Rearing technique now developed for these two species.

3 - Development of rearing technique for six additional species of introduced parasites, through a critical study of their biology.

4 - Large scale rearing project with such species as a satisfactory technique is developed.

5 - Continuation of project for recovery of imported species.

a - Bulk collections of infested cornstalks placed in large screened cages. Includes large parasite conservation cages.

b - Collections of host larvae, to be isolated for more accurate knowledge of percentage of parasitism, host relationship, velocity and direction of dispersion, etc.

6 - Native parasites.

a - Laboratory breeding of Trichogramma minutum.

(1) - Test value of field liberations, followed by systematic collections.

(2) - Determine costs and economic possibilities of annual liberations as supplementary a control measure.

b - Continue observations and comparisons re native species.

(1) - Special collection of host eggs to determine effectiveness of T. minutum.

UNITED STATES DEPARTMENT OF AGRICULTURE,

BUREAU OF ENTOMOLOGY,

WASHINGTON, D. C.

CEREAL AND FORAGE INSECT INVESTIGATIONS.

- (2) - Study of morphological characters to aid in their identification and separation from imported European species.
- (3) - Photographic studies, following recently perfected methods.
- (4) - Preparation for reference to group specialists in National Museum or elsewhere.
- d - Continuation studies of native, or introduced parasites, attacking other boring insects which are, or may later, become parasitic upon corn borer. To aid in the identification and separation of various developmental stages of parasites found attacking P. nubilalis.
- e - Continuation of critical studies re the status and abundance of native parasites recovered from large Parasite Conservation cages, with proper allowance for their assignment to the proper host, as determined by isolated, individual rearings. Special attention to comparative status of each native species from year to year, as a natural enemy of P. nubilalis.

B - Parasites (Investigations In the Orient)

- 1 - Continuation of the investigations in co-operation with the Japanese Beetle Laboratory with same general procedure as outlined for European parasitic material.
- a - Biological observations.
- b - Economic "
- c - Ecological "
- d - Parasitic "
  - (1) - Shipment to the U. S. of those species which investigation may demonstrate as suitable for trial in this country.

C - Predators.

- 1 - Continuation of studies to determine status and effectiveness of various predators as enemies of the insect.
- a - Insects (especially Pentatomids)
- b - Spiders
- c - Birds
- d - Animals

VI - Insecticide investigations.

A - Experimental tests.

1 - Materials.

a - Arsenicals (example)

- (1) - Hydrogen lead arsenate.
- (2) - Coated " "
- (3) - Colloidal " "
- (4) - Basic " "
- (5) - Calcium arsenate
- (6) - Etc.

b - Emulsified extracts and water solutions (examples).

- (1) - Pyrethrum.
- (2) - Derris.
- (3) - Pveridine

UNITED STATES DEPARTMENT OF AGRICULTURE,  
BUREAU OF ENTOMOLOGY,

**WASHINGTON, D. C.**

## CEREAL AND FORAGE INSECT INVESTIGATIONS

Figure 1. The relationship between the number of species and the area of forest cover.

(4) - etc.

- 5 -

c - Oil emulsions (examples)

- {1} - Paraffin oils.
- {2} - Fishoils.
- {3} - Etc.

d - Silico-fluorides (examples)

- {1} - Sodium silico-fluoride
- {2} - Potassium     "       "
- {3} - Calcium      "       "
- {4} - Aluminum     "       "

e - {5} - Etc.

e - Tobacco dust

f - Carriers, emulsifiers, adhesives, colloids, etc.,  
employed in preparation and application of insecticidal materials.

2 - Tested for.

a - Toxicity

b - Adhesiveness.

c - Number applications required.

d - Plant tolerance.

e - Compatible combinations.

f - Cost of applications:-

- {1} - For small areas.
- {2} - Large scale.

3 - Application

a - Plots:-

- {1} Tolerance test plots.
- {2} Toxicity     "       "
- {3} Commercial field test plots.
- {4} Alternate check plots.
- {5} Plots in triplicate and distributed over field.

b - Methods:-

- {1} - Compressed-air sprayers.
- {2} - "Rotary fan dusters.
- {3} - Bellows dusters.
- {4} - Power sprayer.
- {5} - Power duster
- {6} - Air plane dusting

c - Supplementary adhesives.

- {1} - Casein.
- {2} - Fish oil soap.
- {3} - Paraffin oil emulsions.

4 - Schedule of applications.

a - Number applications necessary.

b - Application with reference to seasonal development of:-

- {1} - Corn plant.
- {2} - European corn-borer.

c - Relation of application to climatic conditions.

**STAMP OF LOCAL BOARD**

Date

## **INVENTORY OF RECORDS**

B - Laboratory investigations:-

- 1 - Chemical tests
  - a - Exact formulae of material employed.
  - b - Deterioration:-
    - {1} - In storage.
    - {2} - On host plant
  - c - Residues.
    - {1} - Retention of lethal capacity.
    - {2} - Toxicity to human species.
    - {3} - Toxicity to domestic stock.
  - d - Compatible combinations.
  - e - Value of emulsifying agents.
  - f - Cause of intolerance.
- 2 - Biological tests.
  - a - Ovicultural value.
  - b - Larvicidal capacity.
    - {1} - Specific effect.
    - {2} - Rapidity of action.
    - {3} - Quantity required.
    - {4} - Mortality.
- 3 - Relation of insecticides to feeding habits.
  - a - Distribution of insecticide.
  - b - Distribution of feeding punctures.
  - c - Materials ingested.
  - d - Materials rejected.
  - e - Age of larva at first ingestion of plant material.
  - f - Physiology of digestion in 1st instar larvae.
  - g - Importance of cannibalism in feeding habits.
  - h - Nature of tropic-response complex governing feeding reaction.
    - {1} - Hygro-thermal stimulus.
    - {2} - Phototropic stimulus.
    - {3} - Chemotropic stimulus,
    - {4} - Thigmotropic stimulus.
    - {5} - Geotropic stimulus.
  - i - Operation of response complex in relation to presence of insecticides.
  - j - Relation of insecticidal agents to tunneling habit.

C - Trial field tests.

- 1 - Efficiency with respect to plant tolerance.
- 2 - Efficiency with respect to cost of application.

D - Commercial field tests.

- 1 - Efficiency of method and material.
- 2 - Cost of method and material.
- 3 - Profit under commercial conditions.
- 4 - Relation of insecticides to respiratory requirements.
  - a - Distribution of insecticide.
  - b - Source of metabolic oxygen.
  - c - Method of oxygen absorption.
  - d - Specific effect of "contact insecticides".

1  
 2  
 3  
 4  
 5  
 6  
 7  
 8  
 9  
 10  
 11  
 12  
 13  
 14  
 15  
 16  
 17  
 18  
 19  
 20  
 21  
 22  
 23  
 24  
 25  
 26  
 27  
 28  
 29  
 30  
 31  
 32  
 33  
 34  
 35  
 36  
 37  
 38  
 39  
 40  
 41  
 42  
 43  
 44  
 45  
 46  
 47  
 48  
 49  
 50  
 51  
 52  
 53  
 54  
 55  
 56  
 57  
 58  
 59  
 60  
 61  
 62  
 63  
 64  
 65  
 66  
 67  
 68  
 69  
 70  
 71  
 72  
 73  
 74  
 75  
 76  
 77  
 78  
 79  
 80  
 81  
 82  
 83  
 84  
 85  
 86  
 87  
 88  
 89  
 90  
 91  
 92  
 93  
 94  
 95  
 96  
 97  
 98  
 99  
 100  
 101  
 102  
 103  
 104  
 105  
 106  
 107  
 108  
 109  
 110  
 111  
 112  
 113  
 114  
 115  
 116  
 117  
 118  
 119  
 120  
 121  
 122  
 123  
 124  
 125  
 126  
 127  
 128  
 129  
 130  
 131  
 132  
 133  
 134  
 135  
 136  
 137  
 138  
 139  
 140  
 141  
 142  
 143  
 144  
 145  
 146  
 147  
 148  
 149  
 150  
 151  
 152  
 153  
 154  
 155  
 156  
 157  
 158  
 159  
 160  
 161  
 162  
 163  
 164  
 165  
 166  
 167  
 168  
 169  
 170  
 171  
 172  
 173  
 174  
 175  
 176  
 177  
 178  
 179  
 180  
 181  
 182  
 183  
 184  
 185  
 186  
 187  
 188  
 189  
 190  
 191  
 192  
 193  
 194  
 195  
 196  
 197  
 198  
 199  
 200  
 201  
 202  
 203  
 204  
 205  
 206  
 207  
 208  
 209  
 210  
 211  
 212  
 213  
 214  
 215  
 216  
 217  
 218  
 219  
 220  
 221  
 222  
 223  
 224  
 225  
 226  
 227  
 228  
 229  
 230  
 231  
 232  
 233  
 234  
 235  
 236  
 237  
 238  
 239  
 240  
 241  
 242  
 243  
 244  
 245  
 246  
 247  
 248  
 249  
 250  
 251  
 252  
 253  
 254  
 255  
 256  
 257  
 258  
 259  
 260  
 261  
 262  
 263  
 264  
 265  
 266  
 267  
 268  
 269  
 270  
 271  
 272  
 273  
 274  
 275  
 276  
 277  
 278  
 279  
 280  
 281  
 282  
 283  
 284  
 285  
 286  
 287  
 288  
 289  
 290  
 291  
 292  
 293  
 294  
 295  
 296  
 297  
 298  
 299  
 300  
 301  
 302  
 303  
 304  
 305  
 306  
 307  
 308  
 309  
 310  
 311  
 312  
 313  
 314  
 315  
 316  
 317  
 318  
 319  
 320  
 321  
 322  
 323  
 324  
 325  
 326  
 327  
 328  
 329  
 330  
 331  
 332  
 333  
 334  
 335  
 336  
 337  
 338  
 339  
 340  
 341  
 342  
 343  
 344  
 345  
 346  
 347  
 348  
 349  
 350  
 351  
 352  
 353  
 354  
 355  
 356  
 357  
 358  
 359  
 360  
 361  
 362  
 363  
 364  
 365  
 366  
 367  
 368  
 369  
 370  
 371  
 372  
 373  
 374  
 375  
 376  
 377  
 378  
 379  
 380  
 381  
 382  
 383  
 384  
 385  
 386  
 387  
 388  
 389  
 390  
 391  
 392  
 393  
 394  
 395  
 396  
 397  
 398  
 399  
 400  
 401  
 402  
 403  
 404  
 405  
 406  
 407  
 408  
 409  
 410  
 411  
 412  
 413  
 414  
 415  
 416  
 417  
 418  
 419  
 420  
 421  
 422  
 423  
 424  
 425  
 426  
 427  
 428  
 429  
 430  
 431  
 432  
 433  
 434  
 435  
 436  
 437  
 438  
 439  
 440  
 441  
 442  
 443  
 444  
 445  
 446  
 447  
 448  
 449  
 450  
 451  
 452  
 453  
 454  
 455  
 456  
 457  
 458  
 459  
 460  
 461  
 462  
 463  
 464  
 465  
 466  
 467  
 468  
 469  
 470  
 471  
 472  
 473  
 474  
 475  
 476  
 477  
 478  
 479  
 480  
 481  
 482  
 483  
 484  
 485  
 486  
 487  
 488  
 489  
 490  
 491  
 492  
 493  
 494  
 495  
 496  
 497  
 498  
 499  
 500  
 501  
 502  
 503  
 504  
 505  
 506  
 507  
 508  
 509  
 510  
 511  
 512  
 513  
 514  
 515  
 516  
 517  
 518  
 519  
 520  
 521  
 522  
 523  
 524  
 525  
 526  
 527  
 528  
 529  
 530  
 531  
 532  
 533  
 534  
 535  
 536  
 537  
 538  
 539  
 540  
 541  
 542  
 543  
 544  
 545  
 546  
 547  
 548  
 549  
 550  
 551  
 552  
 553  
 554  
 555  
 556  
 557  
 558  
 559  
 560  
 561  
 562  
 563  
 564  
 565  
 566  
 567  
 568  
 569  
 570  
 571  
 572  
 573  
 574  
 575  
 576  
 577  
 578  
 579  
 580  
 581  
 582  
 583  
 584  
 585  
 586  
 587  
 588  
 589  
 590  
 591  
 592  
 593  
 594  
 595  
 596  
 597  
 598  
 599  
 600  
 601  
 602  
 603  
 604  
 605  
 606  
 607  
 608  
 609  
 610  
 611  
 612  
 613  
 614  
 615  
 616  
 617  
 618  
 619  
 620  
 621  
 622  
 623  
 624  
 625  
 626  
 627  
 628  
 629  
 630  
 631  
 632  
 633  
 634  
 635  
 636  
 637  
 638  
 639  
 640  
 641  
 642  
 643  
 644  
 645  
 646  
 647  
 648  
 649  
 650  
 651  
 652  
 653  
 654  
 655  
 656  
 657  
 658  
 659  
 660  
 661  
 662  
 663  
 664  
 665  
 666  
 667  
 668  
 669  
 660  
 661  
 662  
 663  
 664  
 665  
 666  
 667  
 668  
 669  
 670  
 671  
 672  
 673  
 674  
 675  
 676  
 677  
 678  
 679  
 680  
 681  
 682  
 683  
 684  
 685  
 686  
 687  
 688  
 689  
 690  
 691  
 692  
 693  
 694  
 695  
 696  
 697  
 698  
 699  
 700  
 701  
 702  
 703  
 704  
 705  
 706  
 707  
 708  
 709  
 700  
 701  
 702  
 703  
 704  
 705  
 706  
 707  
 708  
 709  
 710  
 711  
 712  
 713  
 714  
 715  
 716  
 717  
 718  
 719  
 710  
 711  
 712  
 713  
 714  
 715  
 716  
 717  
 718  
 719  
 720  
 721  
 722  
 723  
 724  
 725  
 726  
 727  
 728  
 729  
 720  
 721  
 722  
 723  
 724  
 725  
 726  
 727  
 728  
 729  
 730  
 731  
 732  
 733  
 734  
 735  
 736  
 737  
 738  
 739  
 730  
 731  
 732  
 733  
 734  
 735  
 736  
 737  
 738  
 739  
 740  
 741  
 742  
 743  
 744  
 745  
 746  
 747  
 748  
 749  
 740  
 741  
 742  
 743  
 744  
 745  
 746  
 747  
 748  
 749  
 750  
 751  
 752  
 753  
 754  
 755  
 756  
 757  
 758  
 759  
 750  
 751  
 752  
 753  
 754  
 755  
 756  
 757  
 758  
 759  
 760  
 761  
 762  
 763  
 764  
 765  
 766  
 767  
 768  
 769  
 760  
 761  
 762  
 763  
 764  
 765  
 766  
 767  
 768  
 769  
 770  
 771  
 772  
 773  
 774  
 775  
 776  
 777  
 778  
 779  
 770  
 771  
 772  
 773  
 774  
 775  
 776  
 777  
 778  
 779  
 780  
 781  
 782  
 783  
 784  
 785  
 786  
 787  
 788  
 789  
 780  
 781  
 782  
 783  
 784  
 785  
 786  
 787  
 788  
 789  
 790  
 791  
 792  
 793  
 794  
 795  
 796  
 797  
 798  
 799  
 790  
 791  
 792  
 793  
 794  
 795  
 796  
 797  
 798  
 799  
 800  
 801  
 802  
 803  
 804  
 805  
 806  
 807  
 808  
 809  
 800  
 801  
 802  
 803  
 804  
 805  
 806  
 807  
 808  
 809  
 810  
 811  
 812  
 813  
 814  
 815  
 816  
 817  
 818  
 819  
 810  
 811  
 812  
 813  
 814  
 815  
 816  
 817  
 818  
 819  
 820  
 821  
 822  
 823  
 824  
 825  
 826  
 827  
 828  
 829  
 820  
 821  
 822  
 823  
 824  
 825  
 826  
 827  
 828  
 829  
 830  
 831  
 832  
 833  
 834  
 835  
 836  
 837  
 838  
 839  
 830  
 831  
 832  
 833  
 834  
 835  
 836  
 837  
 838  
 839  
 840  
 841  
 842  
 843  
 844  
 845  
 846  
 847  
 848  
 849  
 840  
 841  
 842  
 843  
 844  
 845  
 846  
 847  
 848  
 849  
 850  
 851  
 852  
 853  
 854  
 855  
 856  
 857  
 858  
 859  
 850  
 851  
 852  
 853  
 854  
 855  
 856  
 857  
 858  
 859  
 860  
 861  
 862  
 863  
 864  
 865  
 866  
 867  
 868  
 869  
 860  
 861  
 862  
 863  
 864  
 865  
 866  
 867  
 868  
 869  
 870  
 871  
 872  
 873  
 874  
 875  
 876  
 877  
 878  
 879  
 870  
 871  
 872  
 873  
 874  
 875  
 876  
 877  
 878  
 879  
 880  
 881  
 882  
 883  
 884  
 885  
 886  
 887  
 888  
 889  
 880  
 881  
 882  
 883  
 884  
 885  
 886  
 887  
 888  
 889  
 890  
 891  
 892  
 893  
 894  
 895  
 896  
 897  
 898  
 899  
 890  
 891  
 892  
 893  
 894  
 895  
 896  
 897  
 898  
 899  
 900  
 901  
 902  
 903  
 904  
 905  
 906  
 907  
 908  
 909  
 900  
 901  
 902  
 903  
 904  
 905  
 906  
 907  
 908  
 909  
 910  
 911  
 912  
 913  
 914  
 915  
 916  
 917  
 918  
 919  
 910  
 911  
 912  
 913  
 914  
 915  
 916  
 917  
 918  
 919  
 920  
 921  
 922  
 923  
 924  
 925  
 926  
 927  
 928  
 929  
 920  
 921  
 922  
 923  
 924  
 925  
 926  
 927  
 928  
 929  
 930  
 931  
 932  
 933  
 934  
 935  
 936  
 937  
 938  
 939  
 930  
 931  
 932  
 933  
 934  
 935  
 936  
 937  
 938  
 939  
 940  
 941  
 942  
 943  
 944  
 945  
 946  
 947  
 948  
 949  
 940  
 941  
 942  
 943  
 944  
 945  
 946  
 947  
 948  
 949  
 950  
 951  
 952  
 953  
 954  
 955  
 956  
 957  
 958  
 959  
 950  
 951  
 952  
 953  
 954  
 955  
 956  
 957  
 958  
 959  
 960  
 961  
 962  
 963  
 964  
 965  
 966  
 967  
 968  
 969  
 960  
 961  
 962  
 963  
 964  
 965  
 966  
 967  
 968  
 969  
 970  
 971  
 972  
 973  
 974  
 975  
 976  
 977  
 978  
 979  
 970  
 971  
 972  
 973  
 974  
 975  
 976  
 977  
 978  
 979  
 980  
 981  
 982  
 983  
 984  
 985  
 986  
 987  
 988  
 989  
 980  
 981  
 982  
 983  
 984  
 985  
 986  
 987  
 988  
 989  
 990  
 991  
 992  
 993  
 994  
 995  
 996  
 997  
 998  
 999  
 990  
 991  
 992  
 993  
 994  
 995  
 996  
 997  
 998  
 999  
 1000

- E - Field tests of the more promising materials at Toledo, Ohio Demonstration and Development Farm.
- F - Collaborative insecticide program with various interested state workers, Dominion of Canada and Province of Ontario.

VII - Tropic response (co-operation) with Boyce-Thompson Institute.

- A - Chemotropic response in adult female.
  - 1 - Value of attractant substances.
    - a - Production of volatile extractive constituents of corn, hops, etc.
      - (1) - Extraction at Boyce-Thompson Institute.
      - (2) - Sealed, numbered and shipped.
    - b - Chemotropic tests at Arlington.
      - (1) - Tested for attractant value.
      - (2) - Modified olfactometer employed under controlled conditions.
      - (3) - Field tests employing traps.
    - c - Relation of attractant capacity to practicable application.
  - 2 - Value of repellent substances.
    - a - Production.
    - b - Chemotropic tests.
    - c - Relation to practicable application.
- B - Relation of chemotropism to the normal response complex of the European corn borer.
  - 1 - Investigation of the identity of the chemotropic response
    - a - Separation of a feeding response.
    - b - Separation of a flight response.
    - c - Separation of a mating response.
    - d - Separation of an oviposition response.
  - 2 - Investigation of the response complex causing the induction of chemotropism.
    - a - Influence of the oviposition response on the development of chemotropism.
    - b - Influence of chemotropism on the development of an oviposition reaction.
    - c - Same study of other angles of this problem.
  - 3 - Influence of a tropic reaction on the development of a chemotropic threshold.
    - a - Effect of a phototropic reaction on chemotropic response
    - b - Same type of study of other tropisms.
    - c - Sequence of reactions initiating a chemotropic response.
    - d - The ecological complex in which chemotropism is most acute.
- C - Field investigations of attractant and repellent substances.
  - 1 - Physical state of materials.
    - a - As a volatilizing concentrated liquid.
    - b - Diluted.
      - (1) - Tests of diluents, solvents, and adsorptives.
      - (2) - Supplemental carriers and adhesives.



- c - Emulsified.
- d - Influence and exploitation thermal and hygrostatic air conditions.
- 2 - Field trap experiments attrahent baits.
  - a - Effect of an ecological complex on the efficiency of a trap.
  - b - Coefficient of correlation for bait-trap field work
  - c - Correlation of chemotropism and infestation of planted corn.
  - d - Relation of rate of infestation of crops to various environmental factors by making use of baited traps.
  - e - Investigation of corn-borer population with reference to climatic and ecological complexion of the area.
- D - Tropic response in the larval instars.
  - 1 - Laboratory experiments.
    - a - Identification of tropic reactions.
    - b - Sequence of tropic reactions.
    - c - Influence of response complex phenomena on tropic reactions.
    - d - Measurement of repellent and attrahent values in response phenomena.
  - 2 - Field experiments.
    - a - Relation of response to planting method.
    - b - Relation of response to insecticide application.

## VIII - Miscellaneous.

- A - Photography.
  - 1 - Apparatus and experimental equipment, etc.
  - 2 - Drawings, maps, charts, etc.
  - 3 - Infested plants, typical injury, life-stages, etc.
  - 4 - Parasites and technique employed.
  - 5 - Associated insects and their typical phases.
  - 6 - Photomecrography
- B - Taxonomy and Exhibition.
  - 1 - Preparation and preservation of material for exhibition or study.
  - 2 - All stages of corn borer and associated insects.
  - 3 - Typical samples illustrating injury to host plants.
  - 4 - Preparation of Riker Mounts, etc., for exhibition and illustration.
  - 5 - Arrangement and care of working collection.
- C - Statistics.
  - 1 - Crop losses.
    - a - Corn and other economic crops
- D - Identification, assembling and filing of material sent in by field scouts and quarantine inspectors.



TENTATIVE PROGRAM AND PLAN FOR EUROPEAN

CORN BORER INVESTIGATIONS IN CENTRAL EUROPE ( 1928 )

A - Distribution.

1 - Continued checking of recorded distribution in Hungary, Yugoslavia, Roumania, Poland, Czechoslovakia, and Germany with extended scouting and study in Roumania and Poland may be limited to scouting in northern Poland and into Lithuania and Estonia. Preliminary scouting of important areas in Russia, if arrangements can be made to that end.

B - Seasonal History.

1 - Continued collection of data in Hungary, Yugoslavia, Roumania, Czechoslovakia, Germany and Poland. The most detailed information will be collected in Hungary and Yugoslavia.

a - Seasonal history data will be collected in Hungary and Yugoslavia during the course of the field work from May until October, throughout the main corn growing regions. The progress of pupation and emergence will be determined during the course of dissecting the cornstalks of 1927. Egg counts will be started in the field as soon as possible and continued throughout the period of oviposition, and frequent observations will be made to determine the actual length of time that eggs may be found in the field. From the time that larvae are available in the field, systematic collections will be made of all the specimens found, thus offering a means for not only determining the percentage of individuals in each stage but also the percentage of parasitism. Special collections and studies in selected towns of Danube Basin.

b - Data will also be collected to show the transition zones between areas of one and two-generation seasonal history.

1 - An attempt will be made to secure information from the merging of the two-generation area of the Dalmatian Coast into the one-generation area of Yugoslavia. If time is available, the merging of the two areas will also be studied in the vicinity of Skoplje to Nis, Yugoslavia.

2 - In any area visited particular attention will be paid to the collection of such information as might lead to the knowledge concerning the reactions of the insect to certain distinct types of environment.

C - Abundance and Damage. (continuation of preceding 4-year period)

1 - A thorough study of this point will be continued throughout the central European plains at points covering significant ecological conditions.

a - The collection of this data will include all those points mentioned in the main plan of work.

b - Data upon the infestation in other economic crops than corn.

c - Similar observations will be made to determine the infestation in such plants as related to heavily infested corn.

UNITED STATES DEPARTMENT OF AGRICULTURE,  
BUREAU OF ENTOMOLOGY,

WASHINGTON, D. C.

CEREAL AND FORAGE INSECT INVESTIGATIONS.

Mr. G. E. H. Miller, Director of the Bureau of Entomology, has issued a circular letter to all State Experiment Stations, State Agricultural Colleges, and other agricultural institutions, and to all State and Federal Departments of Agriculture, in which he has invited their cooperation in the investigation of cereal and forage insect pests.

The circular letter states that the Bureau of Entomology has been requested by the Department of Agriculture to conduct a general investigation of cereal and forage insect pests, and that it is desired to have the results of this investigation available to all interested parties as soon as possible.

The circular letter further states that the Bureau of Entomology will be glad to receive information from all sources concerning the occurrence and distribution of cereal and forage insect pests, and that it is desired to have the results of this investigation available to all interested parties as soon as possible.

The circular letter further states that the Bureau of Entomology will be glad to receive information from all sources concerning the occurrence and distribution of cereal and forage insect pests, and that it is desired to have the results of this investigation available to all interested parties as soon as possible.

The circular letter further states that the Bureau of Entomology will be glad to receive information from all sources concerning the occurrence and distribution of cereal and forage insect pests, and that it is desired to have the results of this investigation available to all interested parties as soon as possible.

The circular letter further states that the Bureau of Entomology will be glad to receive information from all sources concerning the occurrence and distribution of cereal and forage insect pests, and that it is desired to have the results of this investigation available to all interested parties as soon as possible.

The circular letter further states that the Bureau of Entomology will be glad to receive information from all sources concerning the occurrence and distribution of cereal and forage insect pests, and that it is desired to have the results of this investigation available to all interested parties as soon as possible.

The circular letter further states that the Bureau of Entomology will be glad to receive information from all sources concerning the occurrence and distribution of cereal and forage insect pests, and that it is desired to have the results of this investigation available to all interested parties as soon as possible.

The circular letter further states that the Bureau of Entomology will be glad to receive information from all sources concerning the occurrence and distribution of cereal and forage insect pests, and that it is desired to have the results of this investigation available to all interested parties as soon as possible.

The circular letter further states that the Bureau of Entomology will be glad to receive information from all sources concerning the occurrence and distribution of cereal and forage insect pests, and that it is desired to have the results of this investigation available to all interested parties as soon as possible.

The circular letter further states that the Bureau of Entomology will be glad to receive information from all sources concerning the occurrence and distribution of cereal and forage insect pests, and that it is desired to have the results of this investigation available to all interested parties as soon as possible.

- d - Observations to be made upon the infestation in weeds following a similar plan.
- D - The determination of economic and non-economic host plants.
- E - Parasites. (continuation of preceding 4-year period)
  - 1 - The effectiveness of the different species of parasites will be studied by means of the various dissections made during the course of the field work. To follow plans already made and carried out during the past four seasons' investigations.
- F - Natural enemies other than parasites.
- G - Control. (continuation of preceding 4-year period)
  - 1 - The effectiveness of control measures, particularly clean-up, measured by an examination of the debris remaining in fields after crops have been harvested and prepared for new sowings. Procedure same as in U. S.
  - 2 - A study of other control measures practiced.
    - a - Analyze the effectiveness of the various planting dates from collected field data.
    - b - Same procedure for other economic crops.
- H - The collection of meteorological records with special emphasis upon those needed for the proper interpretation and correlation of biological data. (continuation of preceding 4-year period)
- I - Continue the collection of agricultural records with special emphasis upon those relating to cultural methods, crop rotations, phenology, associated insects, etc., needed for the proper interpretation of the important facts concerning the insect. In addition to these enumerated points it is hoped to continue the investigation of the possibility of substituting various species of sorghums for corn, as a fodder plant, in regions of heavy infestation. Plantings of five important species of sorghums, selected by the Arlington Laboratory, will be planted in each of five selected localities in the central European plains to determine the susceptibility of these plants to the attack of the insect. This cultural experiment should be continued for at least five years.

UNITED STATES DEPARTMENT OF AGRICULTURE,

BUREAU OF ENTOMOLOGY,

WASHINGTON, D. C.

CEREAL AND FORAGE INSECT INVESTIGATIONS.

TENTATIVE PROGRAM AND PLAN FOR CORN BORER  
INVESTIGATIONS AT SILVER CREEK, N. Y. (1928)

I - Control.

A - Plowing infested material.

1 - Field observations.

- a - Check effectiveness of fall and spring plowing, under farm conditions, following same method of debris examination as in previous years. Especial stress upon fields where larval population was determined in standing stalks or stubble before treatment.
- b - Special observations upon status of weeds, grasses, trash, etc., along fence-row or field margin, of fields where infested cornstalks were plowed under.

B - Burning infested material.

1 - Check effectiveness of burning, under farm conditions, using standard debris examinations as in previous years.

C - Standard debris examination extended to include plant debris on surface of fields subjected to control practices other than those mentioned previously (i.e., poled, raked, burned and disked; poled, raked, burned and plowed; stubble fields disked without previous treatment; stubble fields plowed without previous treatment; stalks plowed without previous treatment, etc.).

D - Observations made in fence rows and weed areas near infested cornfields to determine the degree of infestation which may occur through migration, or other means. These examinations are made in representative areas selected from each fence row or weed area.

E - Observations made on land lying outside clean-up area compared to similar observations made on land within the clean-up area to obtain, if possible, information concerning the value of compulsory clean-up.

F - Check effectiveness of special field machinery.

- 1 - Stubble pulverizer.
- 2 - Burning machine.
- 3 - Low cutting, etc.

G - Seasonal and varietal planting.

1 - Analysis of time of planting and selection of types, varieties or strains of corn, as shown by data secured in annual infestation surveys of commercial fields. Same method as in previous years (taken from II - A).

2 - Continue phenological studies on the development of common trees or shrubs, to correlate plant development with optimum time of planting to avoid severe injury, and with seasonal occurrence of the insect, irrespective of calendar dates.

a - Same plants and phases as in 1927.

H - Host plants (with special reference to control, quarantine and scouting data).

UNITED STATES DEPARTMENT OF AGRICULTURE,  
BUREAU OF ENTOMOLOGY,  
WASHINGTON, D. C.

## CEREAL AND FORAGE INSECT INVESTIGATIONS.

卷之三十一

**WASHINGTON, D. C.**

Digitized by srujanika@gmail.com

On the 6th of April, 1863, he was captured by the rebels at the battle of Fredericksburg.

- 1 - Continue studies of economic plants other than corn, listed as hosts in other single generation areas. Note per cent plants infested, larval population, distance from growing corn and from infested corn refuse of preceding year. Also probable status of plant as true host or shelter plant.
- 2 - Same as above in susceptible weeds and large stemmed grasses.
- 3 - Continue list of host plants.
  - a - Designate probable status of each, as a true host or as a shelter plant.
  - b - Indicate status of infestation in each, as in F - 1.
  - c - For new host plants, secure authentic determination of plant and insect.

I - Disposal of infested material in manure pile or barnyard.

- 1 - Continuation of experiments in animal manure started in fall of 1926, and check on experiments conducted in spring of 1926.

J - Storage of cornstalks (simulating farm storage for fodder)

- 1 - Experimental studies as in previous years.
  - a - Separate lots of infested cornstalks stored under shelter at intervals, from late Autumn to late Spring, under various conditions, i.e. - warm dry, cold dry, cold moist, warm moist, etc., in structures excluding precipitation and in structures partly open to the weather.
    - (1) - Screen each lot, or standard portion thereof, for emergence of adults. Record dates of adult emergence as well as temperature and humidity conditions in storage quarters.
  - 2 - Field observations. Check D - 1 by examination of stalks, corn cobs, ear corn, etc., stored under various conditions on farms.

K - Trap crops. (incidental as in previous years) through an analysis of data in annual infestation surveys.

II - Infestation surveys in corn (same as formerly)

- A - Similar comparative infestation surveys to 1927, in original area of infestation.
- B - Comparative infestation in field and sweet corn, in relation to seasonal planting (an analysis of data under II - A ).
- C - State wide survey in late summer and early autumn. Same plan as in 1927, with details decided prior to survey.
- D - State-wide survey of fields containing cornstalks and stubble during the late autumn to determine, if possible, the larval population of representative fields before clean-up. This information to be used in connection with (determining effectiveness) of clean-up work.

III - Seasonal occurrence and seasonal cycle.

- A - Gross records of seasonal occurrence, reduced to a minimum, to secure same data as in preceding years.

UNITED STATES DEPARTMENT OF AGRICULTURE,

BUREAU OF ENTOMOLOGY,

WASHINGTON, D. C.

CEREAL AND FORAGE INSECT INVESTIGATIONS.

- B - Generation occurrence. Special observations, as formerly, to determine possible development of second generation in the field.
- C - Continuation of project regarding transfer cages of Arlington material. Special effort to keep these experiments up-to-date and to determine possible tendency of two-generation material to revert to a single generation.

IV - Parasites.

- A - Rearing of all parasites, native or introduced, which may develop from collected material, or from incidental collections in the field.
- B - Mating and liberation of foreign parasites sent from Arlington or elsewhere.
- C - Collections for recovery of introduced species.
  - 1 - Large collection cages in western New York and in north-western Pennsylvania includes large Conservation cages.
  - 2 - Small collections of larvae near colony sites, to be isolated for more accurate knowledge of percentage of parasitism, velocity and direction of dispersion. Record place of collection with reference to point of original liberation.

V - Miscellaneous.

- A - Records of winter mortality in the field, under various conditions of exposure. Taken incidentally during the progress of other field work. Specify condition and position of host plant. Note: We need more records on this point from the Silver Creek area.
- B - Identification of material sent in by field scouts and quarantine inspectors.
- C - Special stress on photos illustrating field conditions, field experiments, machinery operations, etc., etc.
- D - Continuation of project to determine percentage of establishment of newly hatched larvae, and factors effecting such establishment.

UNITED STATES DEPARTMENT OF AGRICULTURE.

BUREAU OF ENTOMOLOGY,

WASHINGTON, D. C.

CEREAL AND FORAGE INSECT INVESTIGATIONS.

TENTATIVE PROGRAM AND PLAN FOR CORN BORER  
INVESTIGATIONS AT SANDUSKY, OHIO (1928)

I - Control.

A - Plowing infested material.

1 - Experimental studies.

a - Continuation of project to determine influences inducing larvae to desert plowed under host plants.

b - Comparative mortality, to adult emergence, in trash on soil surface in small area simulating various cultural conditions. No. of larvae in trash computed carefully in each lot. (as in previous years).

{1} - Area where trash is shaded by growing oats.

{2} - " " " " " corn.

{3} - " kept free of vegetation.

(a) - Temperature readings on soil surface and within pieces of trash during periods of high temperature and dessicating winds.

c - Emergence of adults from larvae placed on soil surface on cleanly plowed area. (continuation of preceding years).

(1) - Cage erected over one-half of area just prior to emergence of adults. Remaining portion of area serves as a check to determine possible presence of living larvae on soil surface.

2 - Field observations.

a - Check effectiveness of fall and spring plowing, under farm conditions, following same method of debris examination as in previous years. Especial stress upon fields where larval population was determined in standing stalks or stubble before treatment.

b - Special observations upon status of weeds, grasses, trash, etc., along fence row or field margin, of fields where infested cornstalks were plowed under.

(1) - Percentage of larval migration to a definite lineal feet of cornstalks, placed along field border of a heavily infested sweet corn field, plowed under in late summer.

B - Burning infested material.

1 - Check effectiveness of burning, under farm conditions, using standard debris examination as in previous years.

C - Seasonal and varietal planting.

1 - Analysis of time of planting and selection of types, varieties of strains of corn, as shown by data secured in annual infestation surveys of commercial fields. Same method as in previous years (taken from II-A).

2 - Continue phenological studies on the development of common trees or shrubs, to correlate plant development with optimum time of planting to avoid severe injury, and with seasonal occurrence of the insect, irrespective of calendar dates.

a - Same plants and phases as in 1927.

D - Host plants (with special reference to control, quarantine and scouting data).

1 - Continue studies of economic plants other than corn, listed

UNITED STATES DEPARTMENT OF AGRICULTURE,  
BUREAU OF ENTOMOLOGY,

WASHINGTON, D. C.

FRANCIS KELLY, Director, Bureau of Entomology

CEREAL AND FORAGE INSECT INVESTIGATIONS.

STANLEY GALT, Director of Investigations

RECOMMENDATION OF THE CEREAL AND FORAGE INSECT INVESTIGATION

TO DIRECTOR OF THE BUREAU OF ENTOMOLOGY  
RECOMMENDATION OF THE CEREAL AND FORAGE INSECT INVESTIGATION

as hosts in other single generation areas. Note per cent plants infested, larval population, distance from growing corn and from infested corn refuse of preceding year.

Also probable status of plant as true host or shelter plant.

2 - Same as above in susceptible weeds, and large-stemmed grasses.

3 - Continue list of host plants.

a - Designate probable status of each, as a true host or as a shelter plant.

b - Indicate status of infestation in each, as in E - 1.

c - For new host plants secure authentic determination of plant and insect.

E - Disposal of infested material in manure pile or barnyard.

1 - Continuation of experience in animal manure, started in fall of 1927, and check on experiments conducted in spring of 1927.

F - Storage of cornstalks (simulating farm storage for fodder.)

1 - Experimental studies as in previous years.

a - Separate lots of infested cornstalks stored under shelter at intervals from late Autumn to late Spring, under various conditions, i.e., warm dry, cold dry, warm moist, cold moist, in structures excluding precipitation and in structures partly open to the weather.

(1) - Screen each lot, or standard portion thereof, for emergence of adults. Record dates of adult emergence.

(2) - Late emerging adults confined in cages to note fecundity and seasonal development of progeny.

b - Continuation of observations upon infested cornstalks, baled and stored under various conditions.

2 - Field observations. Check above by examination of stalks, corncobs, ear corn, etc., stored under various conditions on farms.

G - Trap crops (incidental as in previous years) through an analysis of data in annual infestation surveys.

H - Standard debris examinations extended to include plant debris on surface of fields subjected to various control practices, (i.e., plowed; poled, raked, burned and disked; poled, raked, burned and plowed; disked to small grains or other crops without previous treatment, etc.). Particularly in fields where larval population was determined in autumn of 1927.

II - Infestation surveys in corn (same as previous years)

A - Similar comparative infestation surveys to 1927, in original area of infestation.

B - Comparative infestation in field and sweet corn, in relation to Seasonal planting. (an analysis of data under II-A)

C - State wide survey in late summer and early autumn. Same plan as in 1927, with details decided prior to survey.

D - Continuation of statistical studies pertaining to distribution of larvae in individual fields; to determine adequate samples for infestation surveys and the probable errors involved. Also the relationship between per cent of infestation, or larval population, and actual commercial loss. Involves a statistical study of indirect loss.

UNITED STATES DEPARTMENT OF AGRICULTURE,

**BUREAU OF ENTOMOLOGY.**

WASHINGTON, D. C., SEPTEMBER 12, 1923.

## CEREAL AND FORAGE INSECT INVESTIGATIONS.

### III - Habits.

A-Continuation of project to determine percentage of establishment of newly hatched larvae, and factors affecting such establishment.

- 1 - Detailed observations upon egg clusters deposited on different types and varieties of corn under field conditions. Same details as in 1927.
- 2 - Repeat observations re rate of establishment of larvae on late planted corn.
- 3 - Relative mortality of young larvae hatching from eggs naturally deposited on Leaming field corn planted May 8, 15, 22, 29; and June 5 and June 12.
- 4 - Relative mortality of young larvae hatching from eggs naturally laid on Leaming field corn planted in rows, 42", 60", 72" and 84" apart. (Note: It has been observed that few young larvae migrate to the second row of corn, and it is believed possible to materially lessen borer population by interplanting corn with various immune crops, such as soy beans).
- 5 - Relative selection for oviposition of different types and varieties of field and sweet corn, planted on same date.
- 6 - Relative selection for oviposition on Leaming field corn planted on different dates
  - a - Secure heights of corn on definite dates.

B - Continuation of observations upon migration of newly hatched larvae.

C - Determine distance of dispersion of young larvae by wind action, providing preliminary tests give significant indications.

### IV - Parasites and Predators.

A - Rearing of all parasites, native or introduced, which may develop from collected material, or from incidental collections in the field.

B - Mating and liberation of foreign parasites sent from Arlington or elsewhere.

C - Collections for recovery of introduced species.

- 1 - Large collection cages in northeastern, northcentral and northwestern Ohio.
- 2 - Small collections of larvae near colony sites, to be isolated for more accurate knowledge of percentage of parasitism, velocity and direction of parasite dispersion. Record place of collection with reference to original liberation.

D - Incidental observations upon predators encountered.

### V - Seasonal occurrence and seasonal cycle.

A - Gross records of seasonal occurrence, reduced to minimum, to secure same data as in preceding years.

B - Generation occurrence. Special observations, as formerly, to determine possible development of second generation in

the 19th century, the political situation in France was characterized by a series of conflicts between the royalists and the revolutionaries. The royalists, who supported the monarchy and traditional values, were often seen as conservative and reactionary. The revolutionaries, who sought to establish a republic and implement social and political reforms, were often seen as progressive and liberal. This conflict between the two groups was reflected in various aspects of French society, including politics, economics, and culture.

The royalists were generally wealthier and more educated than the revolutionaries. They tended to be more conservative in their political beliefs, favoring a strong central government and traditional social norms. The revolutionaries, on the other hand, were often from lower social classes and were more likely to support radical political changes, such as the abolition of the monarchy and the redistribution of wealth.

the field.

VI - Assemble following data re Life History - based upon field and laboratory observations.  
1 - Duration of adult period.  
a - Total eggs in laboratory  
b - Average eggs per cluster in field

VII - Miscellaneous.

A - Records of winter mortality in field under various conditions of exposure. Taken incidentally during progress of other work. Specify condition and position of host plant.  
B - Stalk and stubble infestation survey as in 1927 to be made in autumn of 1928.  
C - Identification of material sent in by field scouts and quarantine inspectors.  
D - Special stress on photos illustrating field conditions field experiments, machinery operations, etc., etc.  
E - Continuation of studies to determine the duration of the period of disintergration of cornstalks when plowed under in sandy or heavy soils (Four series - one each to be dug up in autumn of 1928, spring of 1929, autumn of 1929 and spring of 1930.)

1. *Amphibolite*  
2. *Metavolcanic*  
3. *Metavolcanic*  
4. *Metavolcanic*  
5. *Metavolcanic*  
6. *Metavolcanic*  
7. *Metavolcanic*  
8. *Metavolcanic*  
9. *Metavolcanic*  
10. *Metavolcanic*  
11. *Metavolcanic*  
12. *Metavolcanic*  
13. *Metavolcanic*  
14. *Metavolcanic*  
15. *Metavolcanic*  
16. *Metavolcanic*  
17. *Metavolcanic*  
18. *Metavolcanic*  
19. *Metavolcanic*  
20. *Metavolcanic*  
21. *Metavolcanic*  
22. *Metavolcanic*  
23. *Metavolcanic*  
24. *Metavolcanic*  
25. *Metavolcanic*  
26. *Metavolcanic*  
27. *Metavolcanic*  
28. *Metavolcanic*  
29. *Metavolcanic*  
30. *Metavolcanic*  
31. *Metavolcanic*  
32. *Metavolcanic*  
33. *Metavolcanic*  
34. *Metavolcanic*  
35. *Metavolcanic*  
36. *Metavolcanic*  
37. *Metavolcanic*  
38. *Metavolcanic*  
39. *Metavolcanic*  
40. *Metavolcanic*  
41. *Metavolcanic*  
42. *Metavolcanic*  
43. *Metavolcanic*  
44. *Metavolcanic*  
45. *Metavolcanic*  
46. *Metavolcanic*  
47. *Metavolcanic*  
48. *Metavolcanic*  
49. *Metavolcanic*  
50. *Metavolcanic*  
51. *Metavolcanic*  
52. *Metavolcanic*  
53. *Metavolcanic*  
54. *Metavolcanic*  
55. *Metavolcanic*  
56. *Metavolcanic*  
57. *Metavolcanic*  
58. *Metavolcanic*  
59. *Metavolcanic*  
60. *Metavolcanic*  
61. *Metavolcanic*  
62. *Metavolcanic*  
63. *Metavolcanic*  
64. *Metavolcanic*  
65. *Metavolcanic*  
66. *Metavolcanic*  
67. *Metavolcanic*  
68. *Metavolcanic*  
69. *Metavolcanic*  
70. *Metavolcanic*  
71. *Metavolcanic*  
72. *Metavolcanic*  
73. *Metavolcanic*  
74. *Metavolcanic*  
75. *Metavolcanic*  
76. *Metavolcanic*  
77. *Metavolcanic*  
78. *Metavolcanic*  
79. *Metavolcanic*  
80. *Metavolcanic*  
81. *Metavolcanic*  
82. *Metavolcanic*  
83. *Metavolcanic*  
84. *Metavolcanic*  
85. *Metavolcanic*  
86. *Metavolcanic*  
87. *Metavolcanic*  
88. *Metavolcanic*  
89. *Metavolcanic*  
90. *Metavolcanic*  
91. *Metavolcanic*  
92. *Metavolcanic*  
93. *Metavolcanic*  
94. *Metavolcanic*  
95. *Metavolcanic*  
96. *Metavolcanic*  
97. *Metavolcanic*  
98. *Metavolcanic*  
99. *Metavolcanic*  
100. *Metavolcanic*

TENTATIVE PROGRAM AND PLAN FOR CORN BORER  
INVESTIGATIONS AT MONROE, MICHIGAN (1928)

---

I - Control.

A - Plowing infested material.

1 - Field Observations.

- a - Check effectiveness of fall and spring plowing, under farm conditions, following standard method of debris examination. Special stress upon fields where larval population was determined in standing stalks or stubble before treatment. Compute percentage of control achieved, based upon larval population before and after treatment.
- b - Special observations upon status of weeds, grasses, trash, etc., along fence-row or field margin, of fields where infested cornstalks were plowed under.

B - Burning infested material.

1 - Check effectiveness of burning, under farm conditions, using standard debris examination.

C - Check effectiveness of various other methods of mechanical control, (i.e. - poled, raked, burned and disked; poled, raked, burned and plowed; stubble fields disked without previous treatment; standing stalks plowed with, or without, previous treatment; stubble fields plowed with, or without, previous treatment, etc.) as in preceding years.

1 - Compute larval population per acre, by standard debris examination. Special stress upon fields where larval population was determined before treatment. Compute percentage of control achieved, based upon larval population per acre before and after treatment.

D - Check effectiveness of special field machinery.

1 - Stubble pulverizer.

2 - Burning machines.

3 - Low cutting devices.

4 - Husker-shredders, etc.,

E - Seasonal and varietal planting.

1 - Analysis of effect of time of planting and selection of types, varieties or strains of corn, as shown by data secured in annual infestation surveys of commercial fields. Same method as in previous years. (Taken from II-A).

2 - Continue phenological studies on the development of common trees or shrubs, to correlate plant development with optimum time of planting to avoid severe injury, and with seasonal occurrence of the insect, irrespective of calendar dates.

a - Same details as recorded in "Plan for 1926".

1908 1909  
1910 1911  
1912 1913  
1914 1915  
1916 1917  
1918 1919  
1920 1921  
1922 1923  
1924 1925  
1926 1927  
1928 1929  
1930 1931  
1932 1933  
1934 1935  
1936 1937  
1938 1939  
1940 1941  
1942 1943  
1944 1945  
1946 1947  
1948 1949  
1950 1951  
1952 1953  
1954 1955  
1956 1957  
1958 1959  
1960 1961  
1962 1963  
1964 1965  
1966 1967  
1968 1969  
1970 1971  
1972 1973  
1974 1975  
1976 1977  
1978 1979  
1980 1981  
1982 1983  
1984 1985  
1986 1987  
1988 1989  
1990 1991  
1992 1993  
1994 1995  
1996 1997  
1998 1999  
2000 2001  
2002 2003  
2004 2005  
2006 2007  
2008 2009  
2010 2011  
2012 2013  
2014 2015  
2016 2017  
2018 2019  
2020 2021  
2022 2023  
2024 2025  
2026 2027  
2028 2029  
2030 2031  
2032 2033  
2034 2035  
2036 2037  
2038 2039  
2040 2041  
2042 2043  
2044 2045  
2046 2047  
2048 2049  
2050 2051  
2052 2053  
2054 2055  
2056 2057  
2058 2059  
2060 2061  
2062 2063  
2064 2065  
2066 2067  
2068 2069  
2070 2071  
2072 2073  
2074 2075  
2076 2077  
2078 2079  
2080 2081  
2082 2083  
2084 2085  
2086 2087  
2088 2089  
2090 2091  
2092 2093  
2094 2095  
2096 2097  
2098 2099  
2100 2101  
2102 2103  
2104 2105  
2106 2107  
2108 2109  
2110 2111  
2112 2113  
2114 2115  
2116 2117  
2118 2119  
2120 2121  
2122 2123  
2124 2125  
2126 2127  
2128 2129  
2130 2131  
2132 2133  
2134 2135  
2136 2137  
2138 2139  
2140 2141  
2142 2143  
2144 2145  
2146 2147  
2148 2149  
2150 2151  
2152 2153  
2154 2155  
2156 2157  
2158 2159  
2160 2161  
2162 2163  
2164 2165  
2166 2167  
2168 2169  
2170 2171  
2172 2173  
2174 2175  
2176 2177  
2178 2179  
2180 2181  
2182 2183  
2184 2185  
2186 2187  
2188 2189  
2190 2191  
2192 2193  
2194 2195  
2196 2197  
2198 2199  
2200 2201  
2202 2203  
2204 2205  
2206 2207  
2208 2209  
2210 2211  
2212 2213  
2214 2215  
2216 2217  
2218 2219  
2220 2221  
2222 2223  
2224 2225  
2226 2227  
2228 2229  
2230 2231  
2232 2233  
2234 2235  
2236 2237  
2238 2239  
2240 2241  
2242 2243  
2244 2245  
2246 2247  
2248 2249  
2250 2251  
2252 2253  
2254 2255  
2256 2257  
2258 2259  
2260 2261  
2262 2263  
2264 2265  
2266 2267  
2268 2269  
2270 2271  
2272 2273  
2274 2275  
2276 2277  
2278 2279  
2280 2281  
2282 2283  
2284 2285  
2286 2287  
2288 2289  
2290 2291  
2292 2293  
2294 2295  
2296 2297  
2298 2299  
2300 2301  
2302 2303  
2304 2305  
2306 2307  
2308 2309  
2310 2311  
2312 2313  
2314 2315  
2316 2317  
2318 2319  
2320 2321  
2322 2323  
2324 2325  
2326 2327  
2328 2329  
2330 2331  
2332 2333  
2334 2335  
2336 2337  
2338 2339  
2340 2341  
2342 2343  
2344 2345  
2346 2347  
2348 2349  
2350 2351  
2352 2353  
2354 2355  
2356 2357  
2358 2359  
2360 2361  
2362 2363  
2364 2365  
2366 2367  
2368 2369  
2370 2371  
2372 2373  
2374 2375  
2376 2377  
2378 2379  
2380 2381  
2382 2383  
2384 2385  
2386 2387  
2388 2389  
2390 2391  
2392 2393  
2394 2395  
2396 2397  
2398 2399  
2400 2401  
2402 2403  
2404 2405  
2406 2407  
2408 2409  
2410 2411  
2412 2413  
2414 2415  
2416 2417  
2418 2419  
2420 2421  
2422 2423  
2424 2425  
2426 2427  
2428 2429  
2430 2431  
2432 2433  
2434 2435  
2436 2437  
2438 2439  
2440 2441  
2442 2443  
2444 2445  
2446 2447  
2448 2449  
2450 2451  
2452 2453  
2454 2455  
2456 2457  
2458 2459  
2460 2461  
2462 2463  
2464 2465  
2466 2467  
2468 2469  
2470 2471  
2472 2473  
2474 2475  
2476 2477  
2478 2479  
2480 2481  
2482 2483  
2484 2485  
2486 2487  
2488 2489  
2490 2491  
2492 2493  
2494 2495  
2496 2497  
2498 2499  
2500 2501  
2502 2503  
2504 2505  
2506 2507  
2508 2509  
2510 2511  
2512 2513  
2514 2515  
2516 2517  
2518 2519  
2520 2521  
2522 2523  
2524 2525  
2526 2527  
2528 2529  
2530 2531  
2532 2533  
2534 2535  
2536 2537  
2538 2539  
2540 2541  
2542 2543  
2544 2545  
2546 2547  
2548 2549  
2550 2551  
2552 2553  
2554 2555  
2556 2557  
2558 2559  
2560 2561  
2562 2563  
2564 2565  
2566 2567  
2568 2569  
2570 2571  
2572 2573  
2574 2575  
2576 2577  
2578 2579  
2580 2581  
2582 2583  
2584 2585  
2586 2587  
2588 2589  
2590 2591  
2592 2593  
2594 2595  
2596 2597  
2598 2599  
2600 2601  
2602 2603  
2604 2605  
2606 2607  
2608 2609  
2610 2611  
2612 2613  
2614 2615  
2616 2617  
2618 2619  
2620 2621  
2622 2623  
2624 2625  
2626 2627  
2628 2629  
2630 2631  
2632 2633  
2634 2635  
2636 2637  
2638 2639  
2640 2641  
2642 2643  
2644 2645  
2646 2647  
2648 2649  
2650 2651  
2652 2653  
2654 2655  
2656 2657  
2658 2659  
2660 2661  
2662 2663  
2664 2665  
2666 2667  
2668 2669  
2670 2671  
2672 2673  
2674 2675  
2676 2677  
2678 2679  
2680 2681  
2682 2683  
2684 2685  
2686 2687  
2688 2689  
2690 2691  
2692 2693  
2694 2695  
2696 2697  
2698 2699  
2700 2701  
2702 2703  
2704 2705  
2706 2707  
2708 2709  
2710 2711  
2712 2713  
2714 2715  
2716 2717  
2718 2719  
2720 2721  
2722 2723  
2724 2725  
2726 2727  
2728 2729  
2730 2731  
2732 2733  
2734 2735  
2736 2737  
2738 2739  
2740 2741  
2742 2743  
2744 2745  
2746 2747  
2748 2749  
2750 2751  
2752 2753  
2754 2755  
2756 2757  
2758 2759  
2760 2761  
2762 2763  
2764 2765  
2766 2767  
2768 2769  
2770 2771  
2772 2773  
2774 2775  
2776 2777  
2778 2779  
2780 2781  
2782 2783  
2784 2785  
2786 2787  
2788 2789  
2790 2791  
2792 2793  
2794 2795  
2796 2797  
2798 2799  
2800 2801  
2802 2803  
2804 2805  
2806 2807  
2808 2809  
2810 2811  
2812 2813  
2814 2815  
2816 2817  
2818 2819  
2820 2821  
2822 2823  
2824 2825  
2826 2827  
2828 2829  
2830 2831  
2832 2833  
2834 2835  
2836 2837  
2838 2839  
2840 2841  
2842 2843  
2844 2845  
2846 2847  
2848 2849  
2850 2851  
2852 2853  
2854 2855  
2856 2857  
2858 2859  
2860 2861  
2862 2863  
2864 2865  
2866 2867  
2868 2869  
2870 2871  
2872 2873  
2874 2875  
2876 2877  
2878 2879  
2880 2881  
2882 2883  
2884 2885  
2886 2887  
2888 2889  
2890 2891  
2892 2893  
2894 2895  
2896 2897  
2898 2899  
2900 2901  
2902 2903  
2904 2905  
2906 2907  
2908 2909  
2910 2911  
2912 2913  
2914 2915  
2916 2917  
2918 2919  
2920 2921  
2922 2923  
2924 2925  
2926 2927  
2928 2929  
2930 2931  
2932 2933  
2934 2935  
2936 2937  
2938 2939  
2940 2941  
2942 2943  
2944 2945  
2946 2947  
2948 2949  
2950 2951  
2952 2953  
2954 2955  
2956 2957  
2958 2959  
2960 2961  
2962 2963  
2964 2965  
2966 2967  
2968 2969  
2970 2971  
2972 2973  
2974 2975  
2976 2977  
2978 2979  
2980 2981  
2982 2983  
2984 2985  
2986 2987  
2988 2989  
2990 2991  
2992 2993  
2994 2995  
2996 2997  
2998 2999  
2999 3000

F - Host Plants (with special reference to control, quarantine and scouting data).

- 1 - Continuation of studies indicated in previous programs. Particular reference to economic plants, other than corn, listed as hosts in other single generation areas. Note per cent plants infested, larval population, distance from growing corn and from infested corn refuse of preceding year. Also the probable status of the plant as a true host or shelter plant.
  - a - Special stress on such plants when associated with corn.
- 2 - Same as above in susceptible weeds and large-stemmed grasses.
- 3 - Continue list of host plants.
  - a - Designate probable status of each, as a true host or as a shelter plant.
  - b - Indicate data on infestation in each, as in F - 1.
  - c - For new host plants, secure authentic determination of plant and insect.
- 4 - Isolate in cages the following plants; millet, grain sorghums, beets, Xanthium, Polygonum and attempt to rear P. nubilalis thereon for a succession of generations. Use progeny from original cage from year to year.

G - Small scale tests of various insecticides.

- 1 - Critical study of feeding habits of young larvae, i.e. extent of feeding on leaf-blades, tassel buds, etc., and proportion of larvae feeding on exterior of plant.
- 2 - Effect of arsenicals on newly hatched larvae and larvae in later stages.
  - a - Critical observations to determine whether larvae entering stalk (or other portion of plant), ingest plant tissue at point of entrance.

H - Trap crops.

- 1 - Analysis of annual infestation surveys as in previous years.
- 2 - Special observations on selected farms, where corn is planted on progressive dates.

II - Infestation surveys in corn (Same details as in previous programs).

- A - Similar comparative survey on same farms and in the same townships as in 1927 and previous years.
- B - Comparative infestation in field and sweet corn, in relation to seasonal planting (an analysis of data under II-A).
- C - State-wide survey in late summer and early autumn. Same as in "Plan for 1927" with details decided prior to survey.

III - Seasonal occurrence and seasonal cycle.

- A - Gross records of seasonal occurrence, reduced to a minimum, to secure same data as detailed in previous programs.
- B - Generation occurrence - Same details as enumerated in previous programs to determine possible development of second generation.

versus rotundata. - 100 to 1500  
and dispersed to scattered, mostly  
nearer surface. - 8

Masses of rock and gravel  
and stones, 100 to 1500  
and dispersed to scattered, mostly  
nearer surface. - 8

Masses of rock and gravel  
and stones, 100 to 1500  
and dispersed to scattered, mostly  
nearer surface. - 8

Masses of rock and gravel  
and stones, 100 to 1500  
and dispersed to scattered, mostly  
nearer surface. - 8

Masses of rock and gravel  
and stones, 100 to 1500  
and dispersed to scattered, mostly  
nearer surface. - 8

Masses of rock and gravel  
and stones, 100 to 1500  
and dispersed to scattered, mostly  
nearer surface. - 8

IV - Parasites and predators.

- A - Rearing of all parasites, native or introduced, which may develop from collected material, or from incidental collections in the field.
- B - Mating and liberation of foreign parasites sent from Arlington or elsewhere. Points of liberation in Michigan same as in 1927.
- C - Special project for the continuation of rearing Microbracon and Exeristes as in 1927. Points of liberation in Michigan, Ohio and Indiana same as in 1927.
- D - Small scale experiment to determine ability of Microbracon and Exeristes adults to reach soil surface in healthy condition after plowing.
- E - Collections for recovery of all introduced species.
  - 1 - Large collection cages in three selected points of Michigan.
  - 2 - Small collections of larvae near colony sites, to be isolated for more accurate knowledge of percentage of parasitism, host relationship, velocity and direction of dispersion, etc. Record point of collection with reference to point of original liberation.
- F - Special biological studies of two species of parasites other than Exeristes and Microbracon.
- G - Incidental observations upon predators encountered.

V - Miscellaneous.

- A - Records of winter mortality in the field, under various conditions of exposure. Taken incidentally during the progress of other field work. Specify condition and position of host plant. Note: We need more records on this point from Michigan.
- B - Stalk and stubble infestation survey as in 1927 to be made in autumn of 1928.
- C - Identification of material sent in by field scouts and quarantine inspectors from Michigan, Illinois, etc.
- D - Special stress on photos illustrating field conditions, field experiments, machinery operations and similar phases of the work.
- E - Continuation of studies to determine the duration of the period of disintergration of cornstalks when plowed under in sandy or heavy soils, with reference to the period wherein such plowed-under material will afford adequate shelter to migrating borers in instances where the corn-stalk residues are again brought to the soil surface by subsequent plowing.
- F - Plots of miscellaneous field and truck crops to determine their possible infestation by P. nubilalis.

...X...

...X... ESTABLISHING OF THIS ESTABLISHMENT - VI

...X... THE GOVERNMENT OF INDIA, ESTABLISHED IN 1947, HAS BEEN INVOLVED IN THE FORMATION OF THE INDEPENDENT STATE OF PAKISTAN. THE GOVERNMENT OF INDIA HAS BEEN INVOLVED IN THE FORMATION OF THE INDEPENDENT STATE OF PAKISTAN. THE GOVERNMENT OF INDIA HAS BEEN INVOLVED IN THE FORMATION OF THE INDEPENDENT STATE OF PAKISTAN.

...X... THE GOVERNMENT OF INDIA HAS BEEN INVOLVED IN THE FORMATION OF THE INDEPENDENT STATE OF PAKISTAN.

...X... THE GOVERNMENT OF INDIA HAS BEEN INVOLVED IN THE FORMATION OF THE INDEPENDENT STATE OF PAKISTAN.

...X... THE GOVERNMENT OF INDIA HAS BEEN INVOLVED IN THE FORMATION OF THE INDEPENDENT STATE OF PAKISTAN.

...X... THE GOVERNMENT OF INDIA HAS BEEN INVOLVED IN THE FORMATION OF THE INDEPENDENT STATE OF PAKISTAN.

...X... THE GOVERNMENT OF INDIA HAS BEEN INVOLVED IN THE FORMATION OF THE INDEPENDENT STATE OF PAKISTAN.

...X... THE GOVERNMENT OF INDIA HAS BEEN INVOLVED IN THE FORMATION OF THE INDEPENDENT STATE OF PAKISTAN.

...X... THE GOVERNMENT OF INDIA HAS BEEN INVOLVED IN THE FORMATION OF THE INDEPENDENT STATE OF PAKISTAN.

...X... THE GOVERNMENT OF INDIA HAS BEEN INVOLVED IN THE FORMATION OF THE INDEPENDENT STATE OF PAKISTAN.

...X... THE GOVERNMENT OF INDIA HAS BEEN INVOLVED IN THE FORMATION OF THE INDEPENDENT STATE OF PAKISTAN.

...X... THE GOVERNMENT OF INDIA HAS BEEN INVOLVED IN THE FORMATION OF THE INDEPENDENT STATE OF PAKISTAN.

...X... THE GOVERNMENT OF INDIA HAS BEEN INVOLVED IN THE FORMATION OF THE INDEPENDENT STATE OF PAKISTAN.

...X...

...X... THE GOVERNMENT OF INDIA HAS BEEN INVOLVED IN THE FORMATION OF THE INDEPENDENT STATE OF PAKISTAN.

...X... THE GOVERNMENT OF INDIA HAS BEEN INVOLVED IN THE FORMATION OF THE INDEPENDENT STATE OF PAKISTAN.

TENTATIVE PROGRAM AND PLAN FOR CORN BORER

INVESTIGATIONS. TOLEDO, OHIO. (1928)

I - Control (co-operation with engineers, agronomists, etc.)

A - Plowing infested material.

1 - Field observations. Check effectiveness of fall and spring plowing, under farm conditions, following standard method of debris examination. Special stress upon fields where larval population was determined in standing stalks or stubble before treatment. Compute percentage of control achieved, based upon larval population before and after treatment.

a - Special observations upon status of weeds, grasses, trash, etc., along fence-row or field margin, of fields where infested cornstalks were plowed under.

B - Burning infested material.

1 - Check effectiveness of burning, under farm conditions, or with special burning machines. (See section I - E also)

C - Check effectiveness of various other methods of mechanical control (i.e. - poled, raked, burned and disked; poled, raked, burned and plowed; stubble fields disked without previous treatment; standing stalks plowed with, or without, previous treatment; stubble fields plowed with, or without, previous treatment; etc., etc., as in preceding years.

1 - Compute larval population per acre, by standard debris examination, as in I - A - 1.

D - Check effectiveness of special machinery.

1 - Stubble pulverizer.

2 - Burning machines.

3 - Low-cutting devices

4 - Husker - shredders.

5 - Ensilage cutters, etc., etc., etc.

E - Heating and combustion tests.

Note: Subject to revision as investigation proceeds.

1 - Free larvae.

a - Construct curve showing time period and temperature required to kill free larvae. If possible, repeat this under different percentages of relative humidity in the oven, viz., sub-normal (approximately 40%), normal (approximately 70%) and above normal (approximately 85-90%).

(1) - Start at 150° F. for 5 minutes - 3 lots of 25 larvae in each lot (triplicate). If complete mortality is secured in all 3 lots, reduce time period and repeat tests (at  $4\frac{1}{2}$  minutes, then 4 minutes,  $3\frac{1}{2}$ , 3,  $2\frac{1}{2}$ , 2,  $1\frac{1}{2}$ , 1, 30 seconds, 15 seconds, 5 seconds and 2 seconds), until a point is reached where a large percentage of larvae consistently survive. If complete mortality is not secured in 5 minutes, increase the time period at 1/2 minute intervals until a complete mortality is secured in all three lots.

(1886) 2-

Windows 7.0.74.101

## INITIATIVE PROGRAM AND PLAN FOR THE FUTURE

(8SEI) 200-01400-380174012011

Repeat at  $155^{\circ}$  F., and at  $5^{\circ}$  intervals, until a point is reached where a consistent kill is secured in exposures not exceeding 2 seconds. When this desired point is reached, a further refinement of the  $5^{\circ}$  interval should be attempted. For example, if all larvae are killed consistently at a temperature of  $205^{\circ}$  F. for 2 seconds, and a few survive at  $200^{\circ}$  F. for 2 seconds, a special series should be conducted at  $201^{\circ}$ ,  $202^{\circ}$ ,  $203^{\circ}$ ,  $204^{\circ}$ , if the apparatus permits such refinements.

- (2) - For tests under 1 - a - (1), it is desirable to use larvae taken from the following environments:
  - (a) - From outdoor temperatures ranging from approximately  $0^{\circ}$  to  $50^{\circ}$  F., at  $10^{\circ}$  intervals.
  - (b) - From indoor temperatures, of 24 hours duration, ranging from  $50^{\circ}$  to  $70^{\circ}$  F., at  $10^{\circ}$  intervals.
  - (c) - From cornstalks containing various amounts of moisture (1%, 5%, 10%, etc.). Include experiments with saturated stalks.
  - (d) - Reverse process from high to low temperatures if possible.
- (3) - Retain all larvae which are not patently beyond recovery, for a period of at least 2 weeks, to determine whether the heating has induced any latent effects. Place them in copper screen cans with folded newspaper. Keep cans in a temperature ranging from  $50$  -  $70^{\circ}$  F. and soak at intervals of 2 or 3 days to provide contact moisture. Keep a check, under same conditions, composed of larvae cut from untreated cornstalks.
- (4) - Same special cage (or basket) must be devised to keep the larvae from coming into direct contact with the sides of the oven. Possibly such cage or basket can be constructed of gauze or 20-mesh copper screen or asbestos flour. Good success has been secured with a small cage made of cheese cloth and small wooden strips, but at high temperatures this arrangement would probably not prove satisfactory. The solution of this point will require experimentation.
- (5) - Develop arrangements to introduce material into oven without appreciable lowering of temperature. Otherwise the time period must be computed from the point when oven reaches the desired temperature. This latter involves a serious inaccuracy owing to accumulated temperature units.

2 - Larvae in Cornstalks.

- a - Construct curve showing time period and temperature required to kill larvae within cornstalks. If possible, repeat this under different humidity conditions as detailed under 1 - a.

otul Ismaïla. Cet état de choses que  
nous ne voulons pas voir se prolonger. Mais il faut faire tout ce qu'il  
est possible pour empêcher une telle chose.

(1) - Start at  $1000^{\circ}$  F., and increase at  $100^{\circ}$  intervals, until a point is reached where a consistent kill is secured in exposures not exceeding 2 seconds. Use 3 lots of 10 infested cornstalks in each test. When this desired point is reached, a further refinement of the  $100^{\circ}$  interval should be attempted. For example, if all larvae are killed consistently at a temperature of  $1600^{\circ}$  F. for 2 seconds, but a few survive at a temperature of  $1500^{\circ}$  F. for 2 seconds, a special series should be conducted at  $1550^{\circ}$ , etc., if the apparatus permits such refinement.

(2) - Same as 1 - a - (2).

(3) - Same as 1 - a - (3).

(4) - Install thermo-couple to obtain reading attained in center of stalks in all tests. Probably the most desirable method will be to include thermo-couples in infested, as well as non-infested cornstalks, in each test, or to conduct a special test to determine whether any variation exists in the penetration of heat in infested and non-infested cornstalks. If a special test of this kind shows little, if any difference between heat penetration in infested and non-infested stalks, it may prove unnecessary to include non-infested stalks in the main experiments of this series.

(5) - Same as 1 - a - (5).

3 - Special Experiments With Infested Cornstalk sections.

a - When temperature and moisture requirement for insuring 100% larval mortality for 2 seconds exposure have been ascertained, test different parts of corn plant to determine possible variations in reaction due to size or composition of different portions of the stalk.

(1) - Three lots of 25 infested corn stalk sections per lot (triplicate), from upper third, from middle third and from lower third of stalk. Include 8-inch stubble, 3 lots, with as many stubble per lot as can be handled by oven.

b - Transfer directly 3 lots, of 25 infested cornstalk sections per lot, from outdoor temperatures of  $10^{\circ}$ ,  $20^{\circ}$ ,  $30^{\circ}$ ,  $40^{\circ}$  F., to immediate indoor temperatures of  $1000^{\circ}$ ,  $1500^{\circ}$ , F., etc., for 2 seconds. Use cornstalks with various moisture content as in 1 - a - (2) - (c).

c - The reverse of preceding series. Transfer directly 3 lots, of 25 infested cornstalk sections per lot, from indoor temperatures of  $50^{\circ}$ ,  $80^{\circ}$ ,  $100^{\circ}$ , and  $150^{\circ}$  for 5 minute exposures and at  $1000^{\circ}$  and  $1500^{\circ}$  F. for an exposure just short of killing point, to outdoor temperatures of  $10^{\circ}$ ,  $20^{\circ}$ ,  $30^{\circ}$ , and  $40^{\circ}$  F.



(1) - Same as 3 - b - (1).

- d - Compare fatal temperatures and time period of larvae contained in succulent green cornstalks (natural moisture) with mortality of larvae contained in cornstalks which have dried out as a feature of maturity but have become saturated or nearly so, with moisture from direct precipitation, or other sources. (Green cornstalks from center of large shocks at Monroe cage or elsewhere).
- e - During progress of tests with cornstalk sections, insert small thermometer, so that bulb registers temperature at the center of the stalk. Remove stalk section at end of time period. Note temperature when stalk section was removed and note whether temperature increases or decreases and the rate of such increase or decrease, at 5 or 10 second intervals.
- f - Simulate, if possible, the effect of heat dilution or movement, when the field burner is subjected to high winds, thus causing much of the heat to be blown away from the cornstalks, or other plant material, toward which it is directed.

4 - When the most effective and practical killing temperature has been determined, construct a melting "plug" or "cone" designed to be inserted in cornstalks in the field and to melt or otherwise verify when proper temperatures are being attained by burning outfits.

## II-Proposed Projects for Toledo Demonstration and Development Farm. (co-operation with engineers, agronomists, etc.).

- A - Demonstration and test of various clean-up measures, in 5-acre unit farms, where a two-year rotation will be practiced, and the entire area kept covered with screen during the period the moths are in flight. Treatment of separate unit areas to be as follows:
  - 1 - Plowed, raked and burned.
  - 2 - Standing stalks plowed, in fall or spring.
  - 3 - Stubble plowed, in fall or spring.
  - 4 - Stalks cut low, removed from field, followed by disking.
  - 5 - Check - no adequate control. Stalks or high stubble disked to small grain, without previous treatment.
  - 6 - Parasites alone - no other adequate control.
- B - Machinery tests.
- C - Varietal and seasonal planting tests.
- D - Emergence of moths from barnyard and manure - pile conditions, duplicating conditions found on average farm.
- E - Continuation of silo tests as a factor in corn borer control.
- F - Demonstration of effectiveness of clean plowing.
  - 1 - Erect screen cage over 1 acre plot of infested cornstalk land, plowed cleanly in fall of 1927. Larval expectancy computed in area before plowing. Cage to be placed in position at time of moth emergence and examination made daily

Streitigkeiten zwischen dem Königreich Preußen und dem Königreich Sachsen

... la que se ha de tener en cuenta es la de la actividad económica y la de la población.

1921 la lista de países europeos que  
tienen autorizaciones para la pesca en el Océano Atlántico.

to determine number of moths emerging from area. Compute percentage of original borer population emerging as moths.

- 2 - Same for 1 acre plowed cleanly in the spring of 1928.
- G - Co-operative corn testing project with University of Illinois.
  - 1 - Three or four varieties of field corn each from northern Illinois, central Illinois and southern Illinois. (varieties to be selected by Holbert & Dungan).
  - 2 - Two or three varieties of canner's sweet corn.
  - 3 - Selfed and hybrid strains,  $F_1$ ,  $F_2$ , and  $F_3$ , including diseased and disease-free varieties. (Selected by Holbert and Dungan).
  - 4 - Varieties to be planted on two different planting dates. The first date of planting to be at the beginning of the normal planting season. The second date of planting to be 10 days later.
  - 5 - Proposed rotation to be Corn, Soy Beans, and Wheat planted with Sweet Clover. Dr. Dungan and Dr. Bauer will recommend matters in connection with soil conditions).
- H - Miscellaneous cultural experiments involving the development of farm practice to bring about clean cultural methods, under corn borer conditions, with due regard to expense involved and general practicability.
- I - Insecticide Tests.
  - 1 - Demonstration and test of the more promising insecticides, developed during detailed experiments at the Arlington, Mass. and Monroe, Mich. laboratories;
- J - Parasite test on egg parasite.
  - 1 - Field test of the practicability of rearing and liberating the egg-parasite *T. minutum*, with subsequent observation of the distance and velocity of dispersion and percentage of egg-parasitism.
- K - Training of field scouts, infestation survey crews, etc.

